

## New records of the shrimp genus *Lissosabineia* (Caridea: Crangonidae) from Australia including descriptions of three new species and a key to world species.

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### Abstract

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Five species of *Lissosabineia* (Crustacea: Caridea: Crangonidae) are reported from Australia: three species are new to science, *L. arthuri* sp. nov. from 260–265 metres off Victoria, *L. beresfordi* sp. nov. from 370–410 metres off Tasmania and *L. lynseyae* sp. nov. from 414–421 metres off Western Australia. Two species are new records for Australian waters, *L. ecarina* Komai, 2006 from 110 metres and *L. indica* (De Man, 1918) from 110–451 metres off the continental shelf of north-western Western Australia. These records expand the number of *Lissosabineia* species previously recorded world wide from five to eight. A revised key and illustrated guide to the world species is provided.

### Keywords

Crustacea, Decapoda, Caridea, Crangonidae, *Lissosabineia*, new species, key, Western Australia, Victoria, Tasmania, Australia, taxonomy.

### Introduction

The crangonid shrimp genus *Lissosabineia* Christoffersen, 1988 inhabit soft bottom sediments of upper bathyal zones at depths between 146–830 m. The five species described worldwide are rare, reported from limited geographic locations that are often confined to or near their type localities: *L. armata* Komai, 2006 from New Caledonia (Komai, 2006), *L. ecarina* Komai, 2006 from the Philippines and Indonesia (Komai, 2006), *L. indica* (De Man, 1918) from the western Pacific, Japan, Indonesia, Coral Sea and New Caledonia (De Man, 1918, De Man, 1920; Chace, 1984; Takeda & Hanamura, 1994; Kim & Natsukari, 2000; Komai, 2006), *L. tridentata* (Pequegnat, 1970) from the Gulf of Mexico (Pequegnat, 1970; Dardeau & Heard, 1983; Christoffersen, 1988; Spivak, 1997; Komai, 2006) and *L. unispinosa* Komai, 2006 from New Caledonia and Tonga (Komai, 2006).

Diagnostic characters of *Lissosabineia* include the pair of lateral teeth on the rostrum, lack of conspicuous lateral carinae on the carapace, a hump-backed abdomen and short, non-chelate second pereopod (Holthuis, 1993; Komai, 2006). Komai (2006) rediagnosed the genus *Lissosabineia* and discussed its close relationship to the genus *Sabineia* Ross, 1835. He disputed the hypothesis of Christoffersen (1998) that the genus had more affinity with *Paracrangon* Dana, 1852, *Vercoia* Baker, 1904 and *Prionocrangon* Wood-Mason & Alcock, 1891 and suggested that the original definition of the genus was derived from insufficient character analysis.

Poore, (2004) recorded *Lissosabineia tridentata* Pequegnat, 1970 from Victoria, Australia and reproduced Dardeau &

Heard's (1983) figure of a specimen from the Gulf of Mexico. The specimen he referred to is here described as a new species.

Examination of a small crangonid collection held at Museum Victoria has uncovered 5 specimens belonging to three new species of this rare genus which are described herein. Three specimens of *L. arthuri* sp. nov. were collected from 260–265 metres off Victoria, one specimen of *L. beresfordi* sp. nov. from 370–410 metres off Tasmania and one specimen of *L. lynseyae* sp. nov. from 414–421 metres off Western Australia. Further material collected recently from the north-western shelf of Western Australia were identified as *L. ecarina* Komai, 2006 from 110 metres and *L. indica* (De Man, 1918) from 110–451 metres and are new records for Australian waters. Due to the rarity of the genus Komai (2006) acknowledged that it was difficult to comment on the biogeography of the genus. He suggested that the highly abbreviated larval development (because of the large and few eggs) goes someway to explaining the limited geographical ranges of the species. These new discoveries expand the geographic range of the genus into the southern hemisphere and increase the number of known species from five to eight.

Abbreviations are: Tas, Tasmania; Vic, Victoria; WA, Western Australia which are all Australian states. NMV, Museum Victoria, Melbourne; WAM, Western Australian Museum, Perth, where material is lodged; cl. refers to the postorbital carapace length. Previously published and original illustrations were scanned and digitally 'inked' using Adobe Illustrator following Coleman's methods (Coleman, 2003).

**Key to world species of *Lissosabineae* Christoffersen, 1988  
(modified from Komai, 2006).**

1. Carapace with only one tooth (epigastric tooth) on dorsal midline .....  
..... *L. unispinosa* [New Caledonia and Tonga, 410–610 m]
- Carapace with two or three teeth on dorsal midline ..... 2
2. Carapace with three teeth on dorsal midline, but without posthepatic tooth ..... 3
- Carapace with two teeth on dorsal midline and one or two posthepatic teeth ..... 4
3. Carapace with small median teeth, epigastric tooth not reaching base of rostrum; median carina on third abdominal somite not extremely high; fourth and fifth pereopods slender .....  
..... *L. tridentata* [Gulf of Mexico, 391 m]
- Carapace with large median spines, epigastric tooth overreaching base of rostrum; median carina on third abdominal somite extremely high; fourth and fifth pereopods very stout .....  
..... *L. armata* [New Caledonia, 770–830 m]
4. Third abdominal somite weakly elevated medially, but without distinctly delineated median carina .....  
..... *L. ecarina* [WA, Philippines and Indonesia, 110–472 m]
- Third abdominal somite weakly or strongly elevated medially, but with distinct median carina ..... 5
5. Dactylus of fourth pereopod long and slender, more than half length of propodus .....  
..... *L. lynseyae* sp. nov [WA, 441–421 m]
- Dactylus of fourth pereopod less than or equal to half length of propodus ..... 6
6. Rostrum styliform in lateral view with relatively shallow ventral blade; third abdominal somite with posterodorsal margin somewhat produced posteriorly .....  
..... *L. indica* [WA, Japan, Indonesia, Coral Sea and New Caledonia, 146–700 m]
- Rostrum blunt in lateral view with medium to deep ventral blade; third abdominal somite with median posterodorsal margin strongly produced posteriorly ..... 7
7. Carapace with second tooth on dorsal midline elevated relative to rostrum and epigastric tooth; first pereopod merus with ventral lamina terminating distally in prominent subacute tooth .....  
..... *L. arthuri* sp. nov [Vic, 260–265 m]
- Carapace with second tooth on dorsal midline equal in height to epigastric tooth and not elevated relative to rostrum; first pereopod merus with ventral lamina terminating distally in small blunt tooth .....  
..... *L. beresfordi* sp. nov [Tas, 370–410 m]

**Systematics**

***Lissosabineae beresfordi* sp. nov**

Figures 1–2, 8.

*Type material.* Holotype. Australia, Southern Ocean, south of Tasmania, Huon 400 site (43°59.5' S, 147°32.76' E–43°59.7' S, 147°33.80' E), 370–410 m, 31 Mar 2007 (stn SS02-2007 06), NMV J57989 (male specimen, cl. 7.0 mm).

*Etymology.* Named for Museum Victoria Principal Curator, Gary Charles Beresford Poore, in gratitude of the opportunities and guidance he has provided the authors.

*Type locality.* Tasmania, Australia, 370–410 m.

*Distribution.* Known only from type location.

*Description.* Based on holotype male.

Rostrum slightly descending, directed forward, laterally compressed, falling just short of distal margin of first segment of antennular peduncle; distal part blunt, broadened with ventral blade; dorsal surface with low, blunt median ridge without setae; lateral tooth strong arising from 0.40 of rostrum; ventral margin straight, unarmed.

Carapace 1.30 times as long as wide. Middorsal carina sharp, extending nearly to posterodorsal margin of carapace, armed with two large teeth; epigastric tooth falling far short of base of rostrum arising at 0.22 of carapace length; second tooth equal in size to the first, arising from 0.57 of carapace length. Dorsal surface of carapace without setae. Antennal tooth small, not reaching anterior margin of cornea of eye. Branchiostegal tooth directed forward, falling short of anterior margin of antennal basicerite. Pterygostomian angle without tooth. Lateral face of carapace with relatively large hepatic and one post hepatic tooth, but epibranchial tooth absent; epibranchial carina conspicuous.

Sternal tooth on fifth thoracic somite well developed in male, extending beyond base of spur on fourth somite.

Second abdominal somite smooth on dorsal surface. Third somite with middorsal carina in posterior 0.52; posterodorsal margin of somite strongly produced posteriorly, partially covering fourth somite. Sixth somite about 1.80 times as long as high; dorsal surface flat on midline. Telson with two pairs of minute dorsolateral spines; posterolateral angle with one short blunt spine and two pairs of longer spines (broken); terminal process tapered, tip rounded.

Antennular peduncle reaching 0.50 of antennal scale; stylocerite reaching nearly distal margin of first segment, spiniform. Antennal scale about 0.67 of carapace length and 3.30 times as long as wide, lateral margin slightly curved, distal blade rounded; basicerite with ventrolateral spine reaching mid length of first segment of antennular peduncle.

Mouthparts not dissected.

First pereopod with palm about 4.35 times as long as wide; cutting edge of palm strongly oblique; pollex relatively large, triangular, slightly recurved; carpus armed with one moderately large spine on lateral margin; merus with strong dorsodistal spine not reaching distal margin of anteriorly extended carpus, distolateral margin without tooth; ventral lamina terminating

distally in small blunt tooth. Second pereopod falling far short of midlength of merus of first pereopod; dactylus about 0.44 length of propodus; propodus not widened distally. Third pereopod slender; ischium about 2.00 times as long as merus. Fourth pereopod moderately slender, overreaching antennal scale by length of dactylus and 0.30 of propodus; dactylus compressed laterally, about 0.37 times as long as propodus, propodus with distal tuft of setae; carpus 0.66 times as long as propodus; merus about ten times as long as wide, unarmed on dorsodistal margin; ischium 0.58 times as long as merus. Fifth pereopod similar to fourth, overreaching antennal scale by length of dactylus and 0.60 of propodus; ischium 0.44 times as long as merus.

**Colour.** Pereopods, ventral half of carapace and ventral third of abdominal somites pigmented red. Rostrum, dorsal carapace, first and sixth somites and telson green pigmented in life.

**Remarks.** All species of *Lissosabineae* recorded from Australia bear two median teeth on the carapace, a trait shared with congeners *L. ecarina* and *L. indica*, both known from Indonesian and now Australian waters. *L. beresfordi* shares the relatively blunt, deep rostrum with *L. arthuri* and to a lesser extent with *L. lynseyae*, the rostrum of which is less broad and spiniform distally. *L. beresfordi* is easily differentiated from *L. arthuri* by the shape of the third abdominal somite and the difference in the ventral lamina on the merus of first pereopod that terminates distally in a small blunt tooth as opposed to the prominent subacute tooth in *L. arthuri*. Also, the two median teeth on the carapace are of equal size and elevation in *L. beresfordi* but are unequal in *L. arthuri*.

### *Lissosabineae ecarina* Komai, 2006

Figure 7.

*Lissosabineae ecarina* Komai, 2006: 49, figs. 10–12.

*Sabineae indica* – Chace, 1984: 59 (part).

**Material examined.** Australia, WA, north-western Australia, Mermaid L24 transect (17°45.63' S–120°42.66' E), 110 m, 19 Jun 2007 (stn SS05-2007 089), NMV J46722 (female specimen, cl. 6.0 mm).

**Type locality.** Kai Islands, Indonesia, 336–346 m.

**Distribution.** Australia, Western Australia. Western Pacific: Philippines and Indonesia; 246–472 m.

**Remarks.** The weakly elevated third abdominal somite and lack of a distinctly delineated median carina distinguishes *L. ecarina* from other species of the genus found in Australian waters. See Komai (2006) for further discussion on differences between *L. ecarina* and *L. indica*.

**Colour.** Unknown in life, faded in ethanol.

### *Lissosabineae arthuri* sp. nov.

Figures 3–4.

*Lissosabineae tridentata*. —Poore, 2004: 139.

Not *Lissosabineae tridentata* Pequegnat, 1970: pp. —Dardeau & Heard, 1983: 29, fig. 15.

**Type material.** Holotype. Australia, Vic, (38°09.80' S, 149°41.71' E–38°10.11' S, 149°41.01' E), 260–265 m, 22 Apr 2000 (stn SS01-2000

199), NMV J59767 (female specimen, cl. 7.3 mm). Paratypes. Same locality as holotypes, NMV J52086 (2 male specimens, cl. 5.6 mm, 5.8 mm).

**Etymology.** Named for the second authors grandfather, Arthur C. Collins. His extensive work on Australian foraminiferans unknowingly helped inspire a career.

**Type locality.** Victoria, Australia, 260–265 m.

**Distribution.** Known only from type location.

**Description.** Based on holotype female.

Rostrum directed forward, laterally compressed, overreaching distal margin of first segment of antennular peduncle; distal part truncate, with deep ventral blade; dorsal surface with median ridge scattered with setae; lateral tooth strong, arising from 0.56 of rostrum; ventral margin straight, unarmed.

Carapace 1.70–1.80 times as long as wide. Middorsal carina sharp, extending nearly to posterodorsal margin of carapace, armed with two large teeth; epigastric tooth falling far short of base of rostrum arising at 0.24 of carapace length; second tooth arising from 0.57 of carapace length. Dorsal surface of carapace with few irregularly scattered setae. Antennal tooth small, not reaching anterior margin of cornea of eye. Branchiostegal tooth directed forward, falling short of anterior margin of antennal basicerite. Pterygostomian angle without tooth. Lateral face of carapace with relatively large hepatic and one post hepatic tooth, but epibranchial tooth absent; epibranchial carina conspicuous.

Fifth thoracic somite without sternal tooth in female.

Second abdominal somite smooth on dorsal surface. Third somite with middorsal carina in posterior 0.50; posterodorsal margin of somite strongly produced posteriorly, partially covering fourth somite. Sixth somite about 2.40 times as long as high; dorsal surface flat on midline. Telson with two pairs of minute dorsolateral spines; posterolateral angle with one short blunt spine and two pairs of longer spines (broken); terminal process pointed.

Antennular peduncle reaching 0.58 of antennal scale; stylocerite falling short of distal margin of first segment, spiniform. Antennal scale about 0.57 of carapace length and 2.72 times as long as wide, lateral margin straight, distal blade rounded; basicerite with ventrolateral spine reaching mid point of first segment of antennular peduncle.

Mouthparts not dissected.

First pereopod with palm about 3.20 times as long as wide; cutting edge of palm strongly oblique; pollex large, triangular, not recurved; carpus armed with two moderately large spines on lateral margin; merus with strong dorsodistal spine not reaching distal margin of anteriorly extended carpus, distolateral margin without tooth; ventral lamina terminating distally in subacute tooth. Second pereopod falling far short of mid-length of merus of first pereopod; dactylus about 0.38 length of propodus; propodus not widened distally. Third pereopod slender; ischium about 2.90 times as long as merus. Fourth pereopod moderately stout, overreaching antennal scale by length of dactylus and 0.30 of propodus; dactylus compressed laterally, about 0.45 times as long as propodus, propodus with distal tuft of setae; carpus 0.73 times as long as propodus; merus about seven times as long as wide, unarmed on dorsodistal

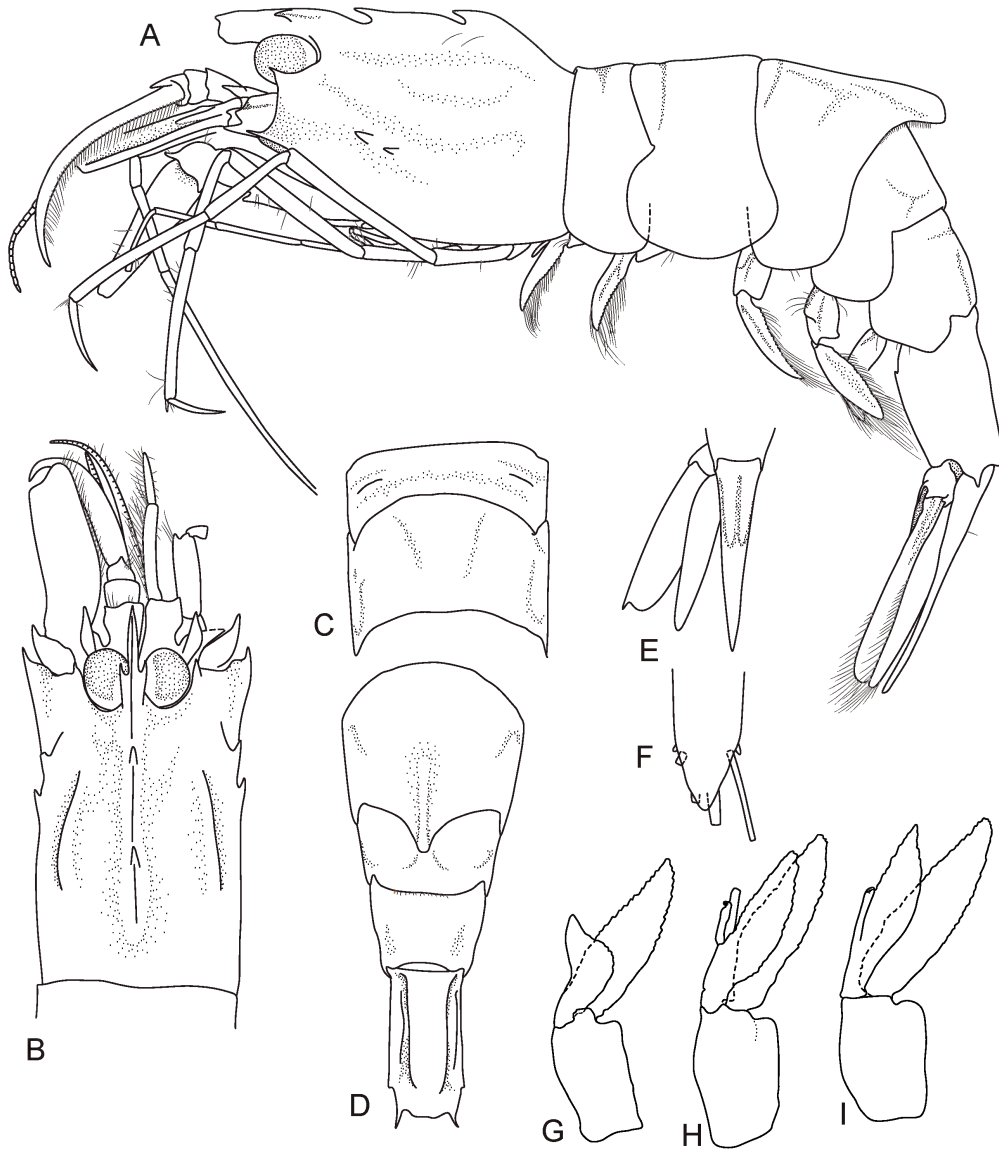


Figure 1. *Lissosabinea beresfordi* sp. nov., holotype male, cl. 7.0 mm, NMV J57989, Tasmania, Australia. A, entire animal in lateral view; B, carapace, dorsal view; C, first and second abdominal somites, dorsal view; D, third to sixth abdominal somites, dorsal view; E, telson and uropods, dorsal view; F, telson, dorsal view (magnified  $\times 5.0$  relative to E); G, left first pleopod (setae omitted); H, left second pleopod (setae omitted); I, left third pleopod (setae omitted).

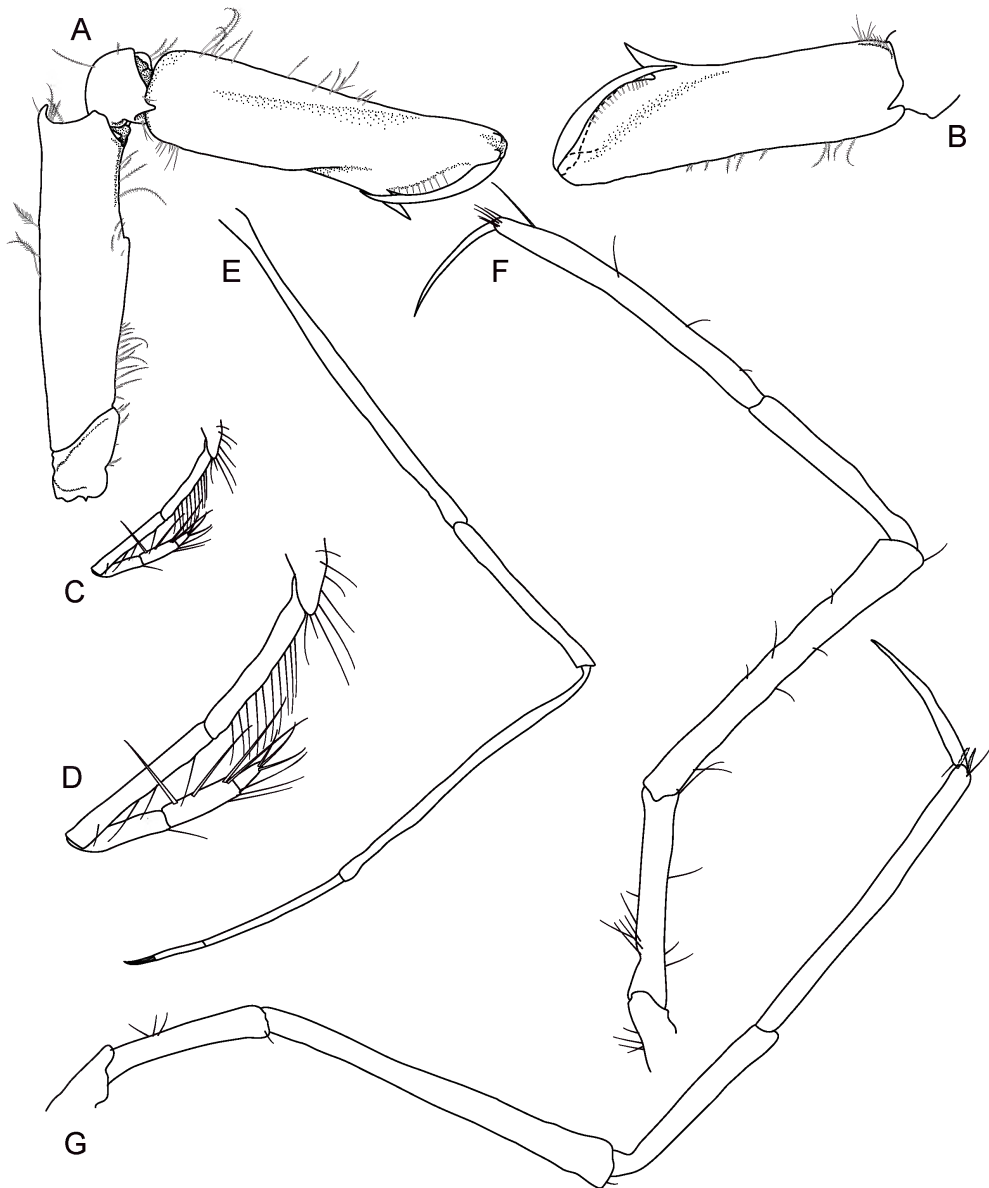


Figure 2. *Lissosabineae beresfordi* sp. nov., holotype male, (cl. 7.0 mm), NMV J57989, Tasmania, Australia. A, subchela of right first pleopod, dorsal view; B, subchela of left first pleopod, lateral view; C, left second pereopod, lateral view; D, left second pereopod, lateral view (magnified x 2.0 relative to D); E, right third pereopod, lateral view; F, left fourth pereopod, lateral view; G, left fifth pereopod, lateral view.



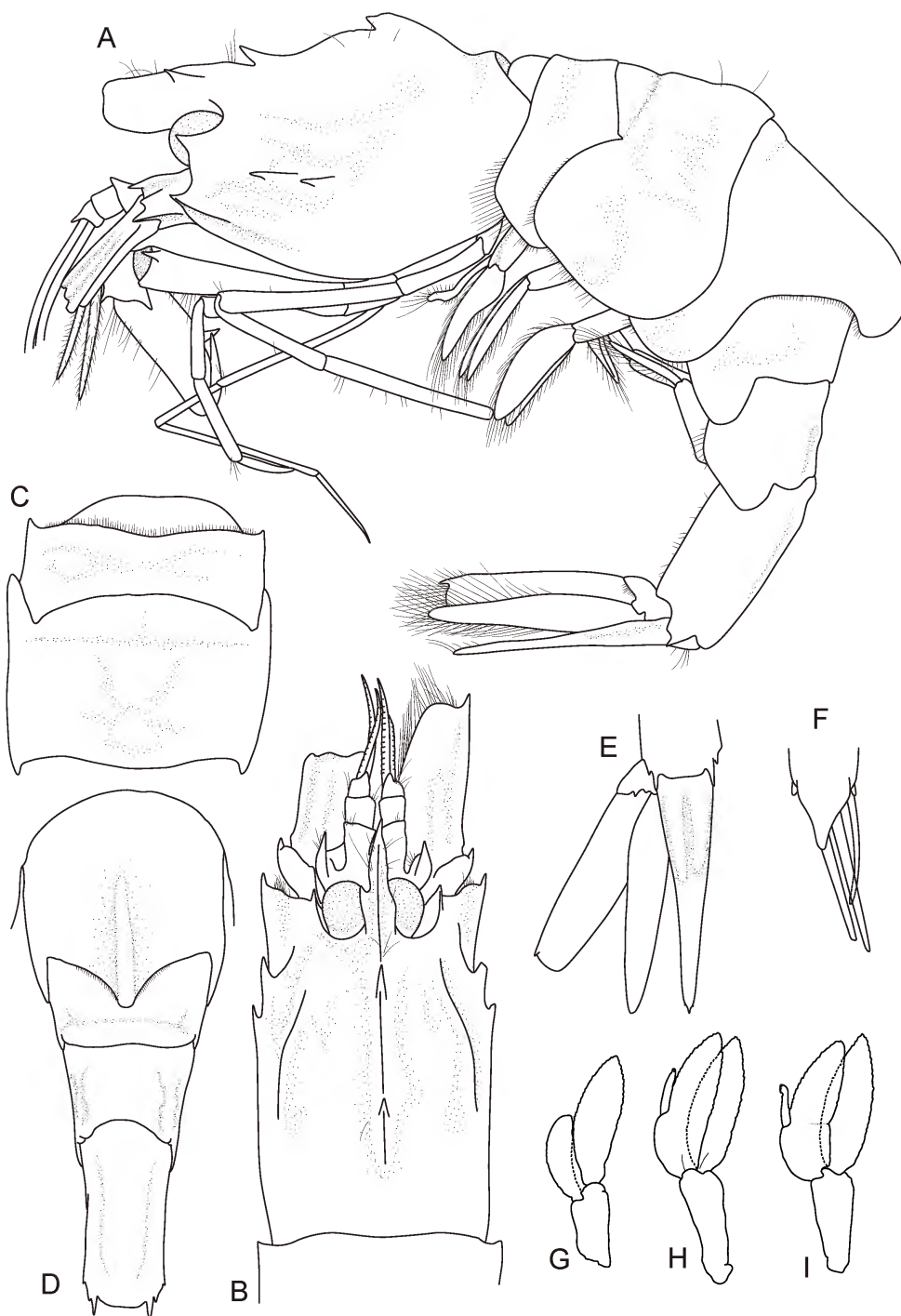


Figure 3. *Lissosabineia arthuri* sp. nov., holotype female (cl. 7.3 mm), NMV J59767, Victoria Australia. A, entire animal in lateral view; B, carapace, dorsal view; C, first and second abdominal somites, dorsal view; D, third to sixth abdominal somites, dorsal view; E, telson and uropods, dorsal view; F, telson, dorsal view (magnified  $\times 4.2$  relative to E); G, left first pleopod (setae omitted); H, left second pleopod (setae omitted); I, left third pleopod (setae omitted).

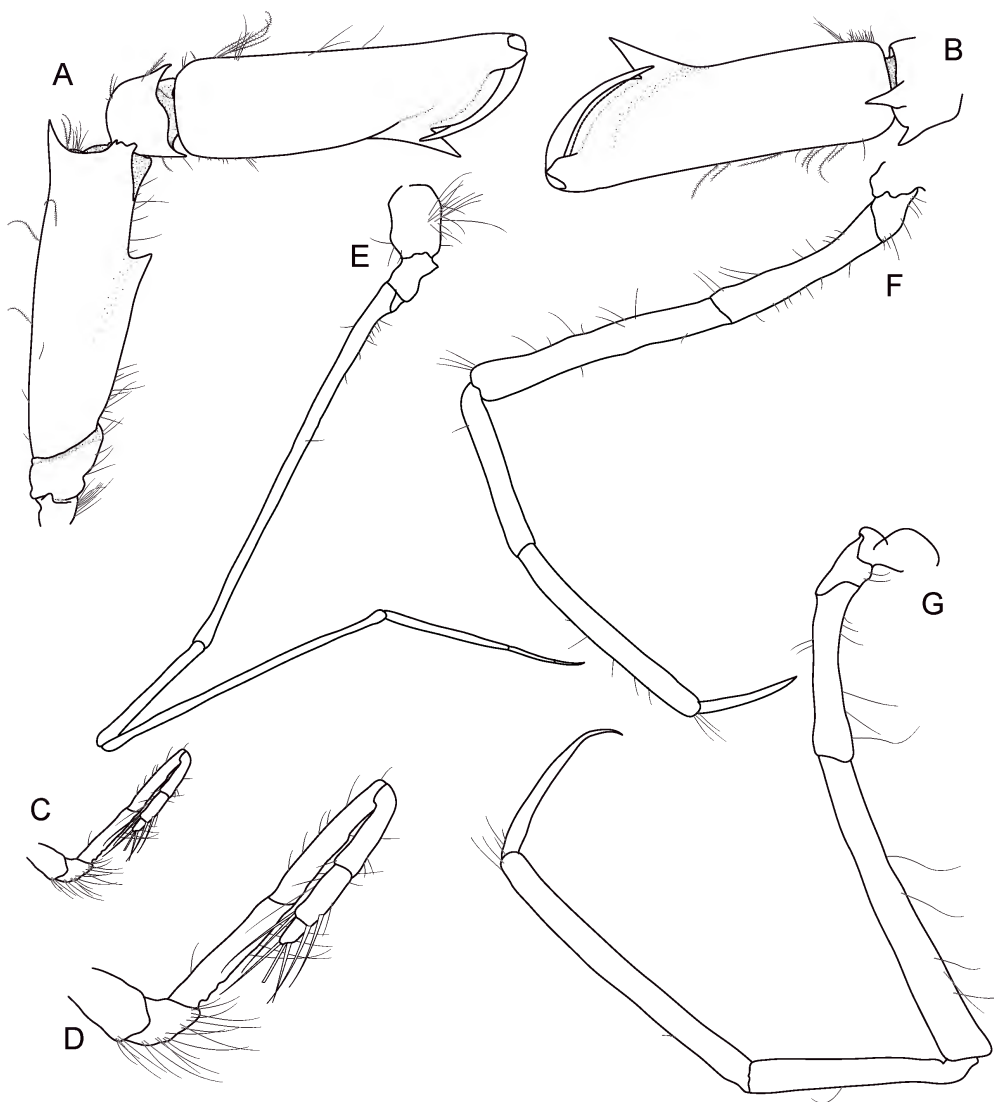


Figure 4. *Lissosabineae arthuri* sp. nov., holotype female (cl. 7.3 mm), NMV J59767, Victoria Australia. A, subchela of right first pleopod, dorsal view; B, subchela of left first pleopod, lateral view; C, left second pereopod, lateral view; D, left second pereopod, lateral view (magnified x 2.0 relative to D); E, left third pereopod, lateral view; F, left fourth pereopod, lateral view; G, right fifth pereopod, lateral view.

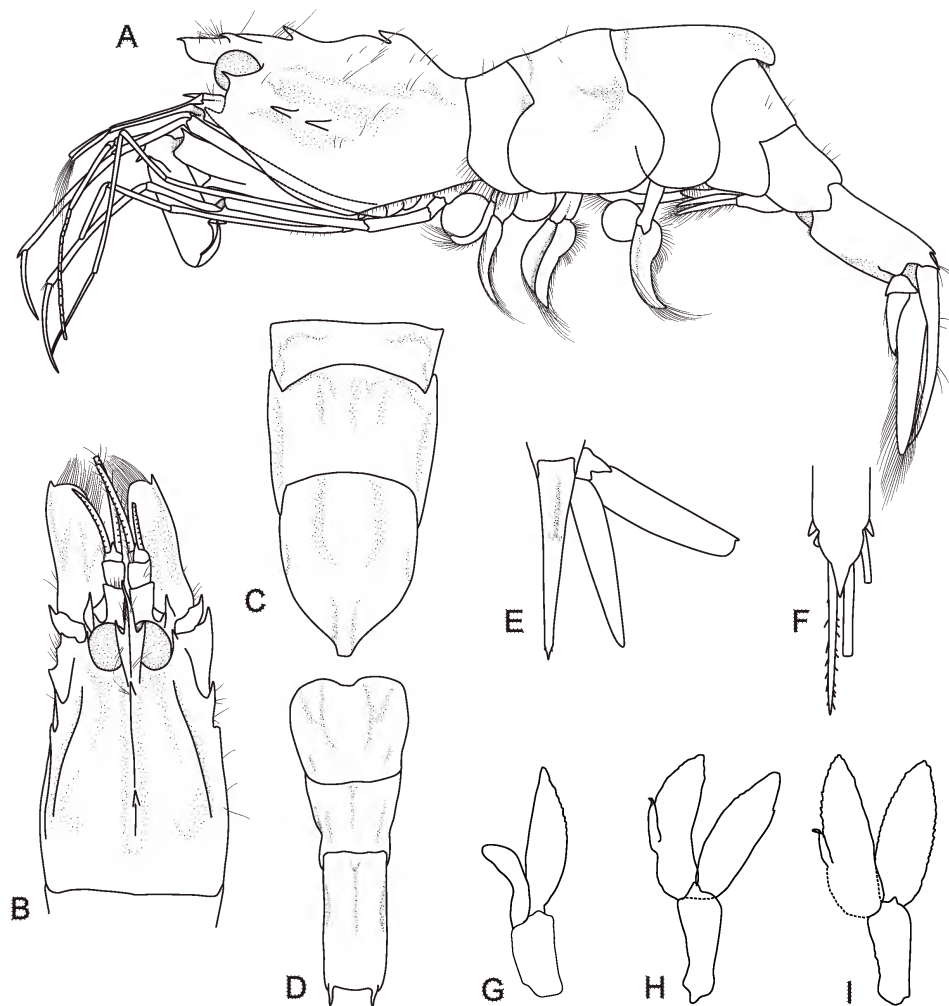


Figure 5. *Lissosabinea lynseyae* sp. nov., holotype female (cl. 5.5 mm), NMV J55492, Western Australia, off Bunbury. A, entire animal in lateral view; B, carapace, dorsal view; C, first and second abdominal somites, dorsal view; D, third to sixth abdominal somites, dorsal view; E, telson and uropods, dorsal view; F, telson, dorsal view (magnified  $\times 4.2$  relative to E); G, left first pleopod (setae omitted); H, left second pleopod (setae omitted); I, left third pleopod (setae omitted).



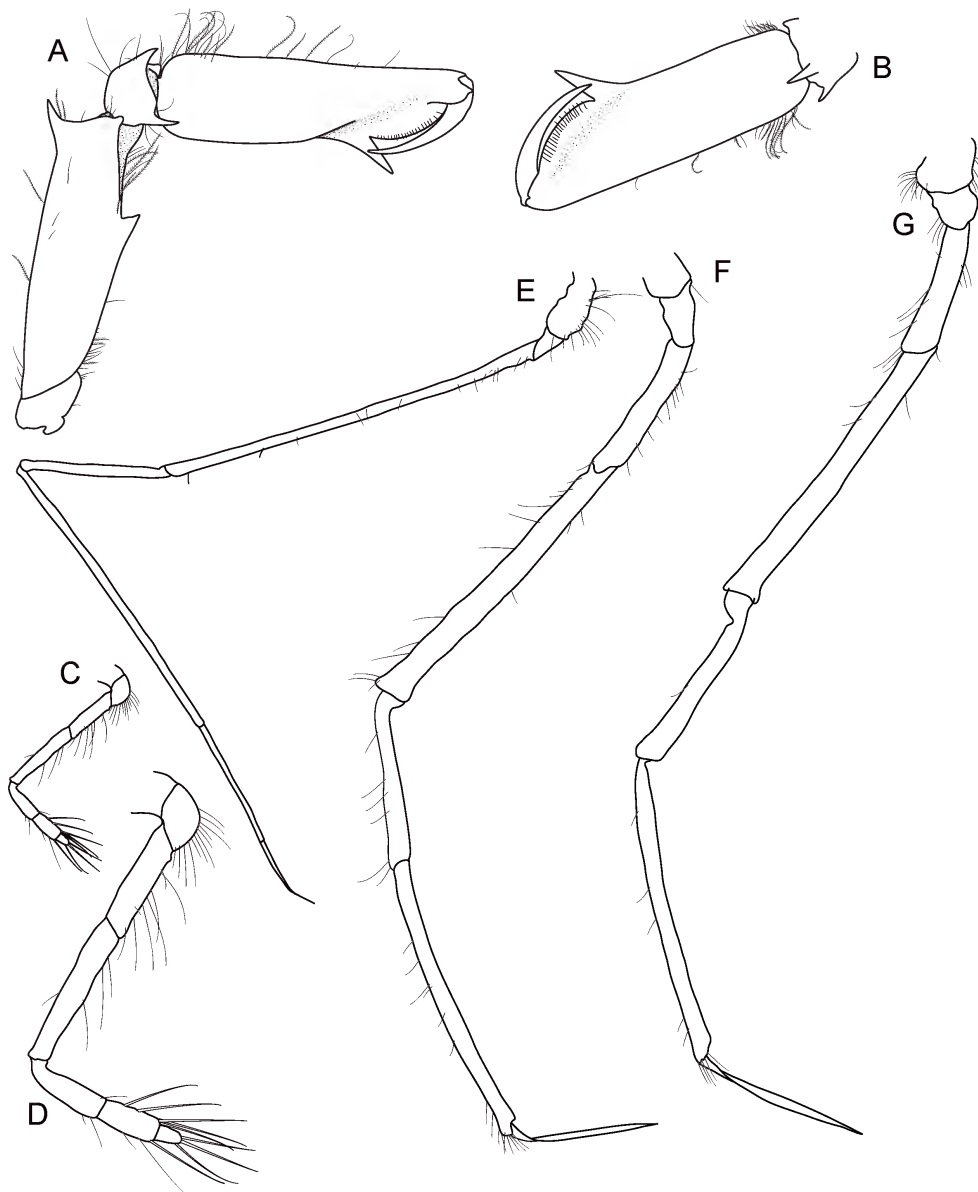


Figure 6. *Lissosabineia lynseyae* sp. nov., holotype female (cl. 5.5 mm), NMV J55492, Western Australia, off Bunbury. A, subchela of right first pleopod, dorsal view; B, subchela of left first pleopod, lateral view; C, left second pereopod, lateral view; D, left second pereopod, lateral view (magnified  $\times 2.0$  relative to D); E, left third pereopod, lateral view; F, left fourth pereopod, lateral view; G, left fifth pereopod, lateral view.

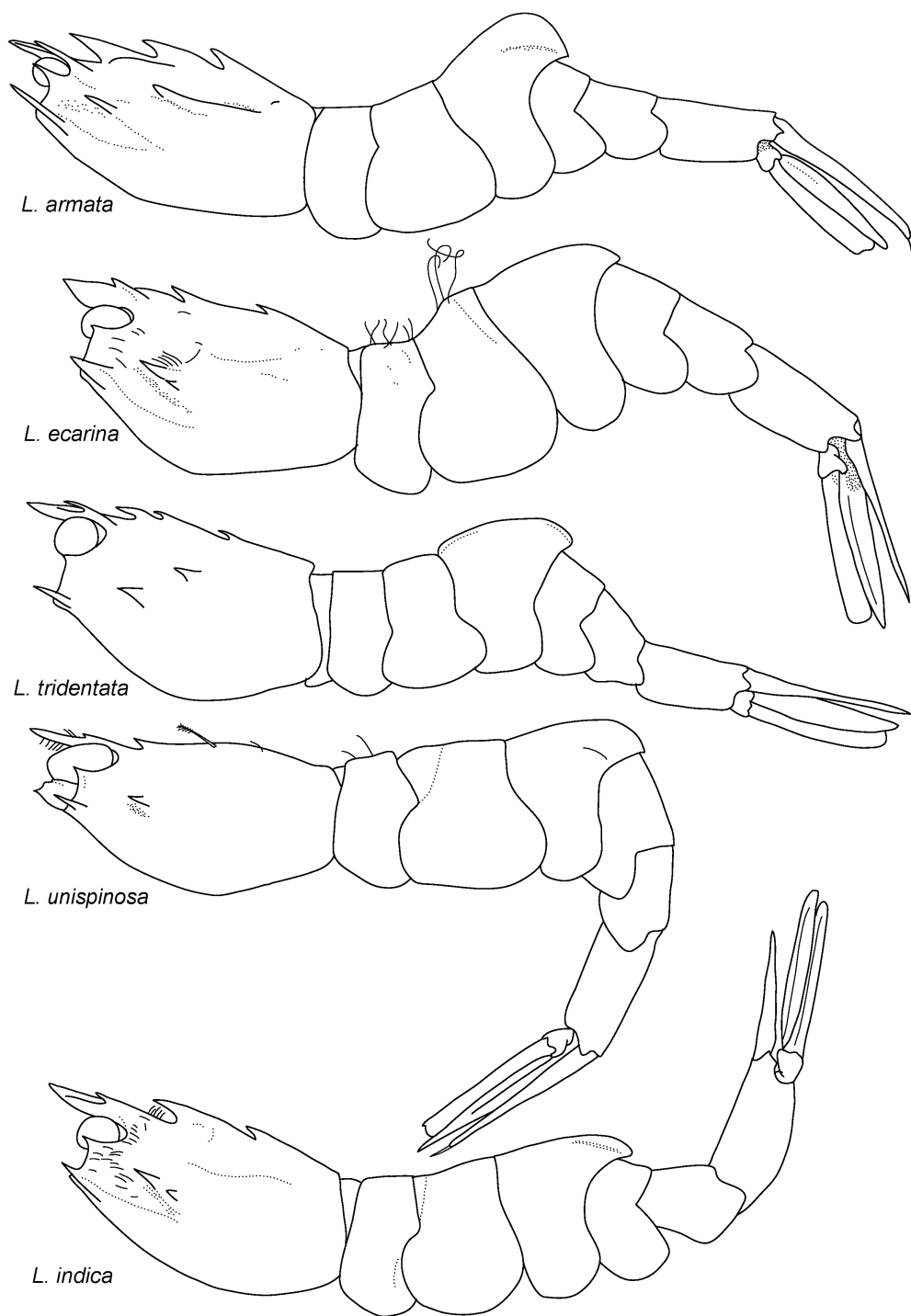


Figure 7. World species of *Lissosabinea*. Carapace and abdomen (lateral view, setae on abdomen omitted). *L. armata* redrawn from Komai, 2006 (fig. 7); *L. ecarina* redrawn from Komai, 2006 (fig. 10); *L. tridentata* redrawn from Dardeau & Heard, 1983 (fig. 15); *L. unispinosa* redrawn from Komai, 2006 (fig. 13); *L. indica* redrawn from Komai, 2006 (fig 1).

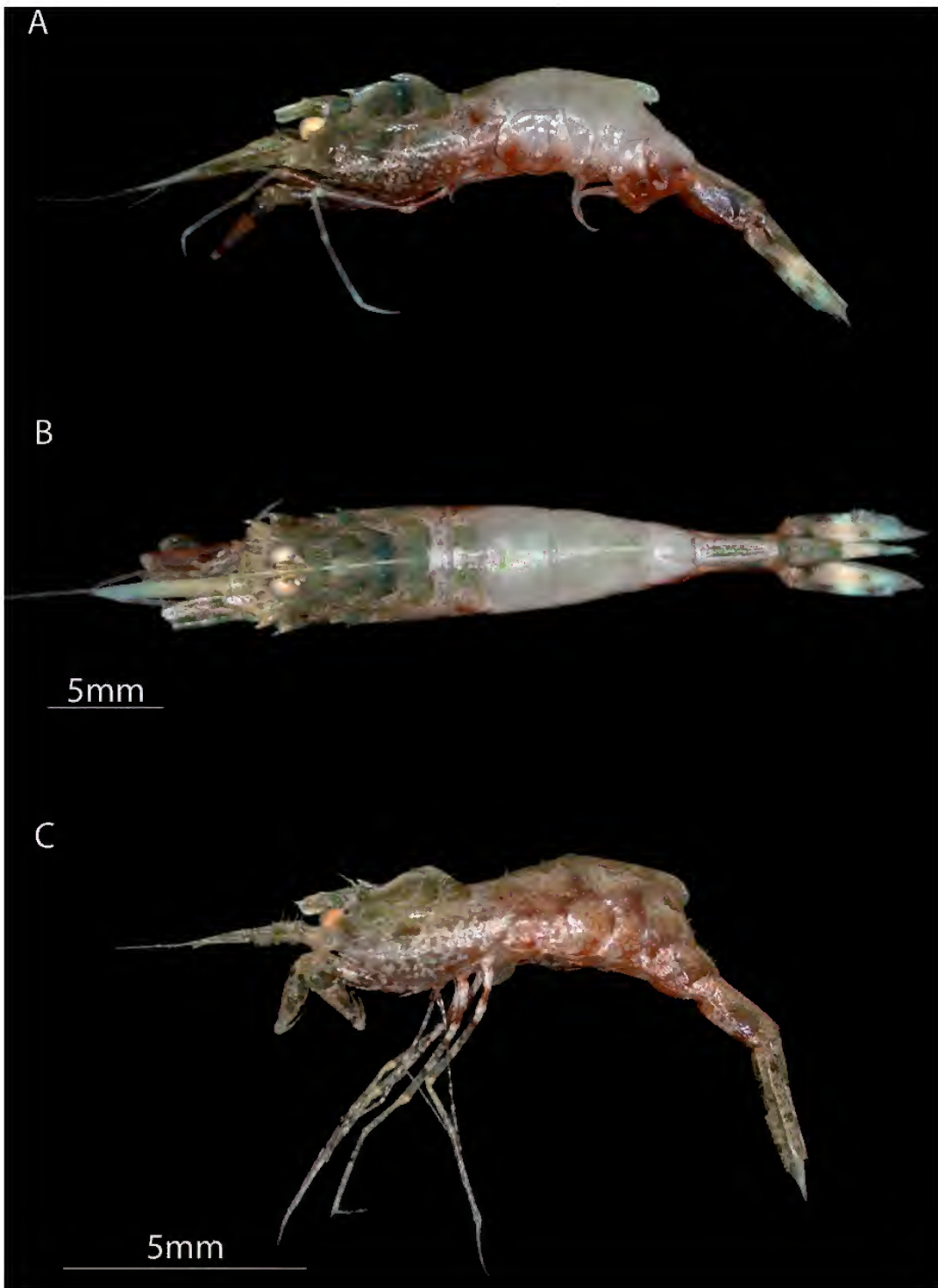


Figure 8. Live animal photographs of *Lissosabineia* copyright CSIRO. A, *Lissosabineia beresfordi* sp. nov., holotype male J57989, lateral view; B, dorsal view. C, *Lissosabineia lynseyae* sp. nov. lateral view, holotype female, cl. 5.5 mm, J54492.

margin; ischium 0.69 times as long as merus. Fifth pereopod similar to fourth, ischium 0.51 times as long as merus.

**Colour.** Unknown in life, faded in ethanol.

**Remarks.** In the paratype males the sternal tooth on the fifth thoracic somite is well developed extending beyond the base of spur on fourth somite. See remarks for *L. beresfordi* sp. nov.

### *Lissosabineia indica* (De Man, 1918)

Figures 7, 9.

*Sabineia indica* De Man, 1918: 304–1920: 303, pl. 25: fig. 75), a-l—Chace, 1984: 59 (in part). —Takeda & Hanamura, 1994: 30.

*Lissosabineia indica*—Christoffersen, 1988: 48. —Kim & Natsukari, 2000: 35 fig. 1, a-b. —Komai, 2006: 37 figs. 1–4.

**Material examined.** Australia, WA, north-western Australia, Mermaid L24 transect (17°45.63' S–120°42.66' E), 110 m, 19 Jun 2007 (stn SS05-2007 089), NMV J46723 (1 damaged specimen, cl. 7.7 mm). Ashmore L30 transect (12°36.00' S, 123°25.53' E–12°36.95' S, 123°26.20' E), 419 m, 8 Jul 2007 (stn SS05-2007 198), NMV J46724 (2 female specimens, cl. 6.5 mm, 8.5 mm). Mermaid L24 north transect (17°01.00' S, 119°35.46' E–17°01.82' S, 119°34.98' E), 451 m, 18 Jun 2007 (stn SS05-2007 080), NMV J46725 (1 female specimen, cl. 8.3 mm, 1 male specimen 7.8 mm).

**Type locality.** Tanah Djampeah Island, Indonesia (400 m).

**Distribution.** Australia, Western Australia. Japan, Indonesia, Coral Sea and New Caledonia; 146–700 m.

**Colour.** The pereopods, carapace and abdominal somites are pigmented red. The anterior carapace is green pigmented dorsally.

**Remarks.** See remarks for *L. ecarina*.

### *Lissosabineia lynseyae* sp. nov.

Figures 5–6, 8.

*Sabineia* sp. nov. 5421.—Poore *et al.*, 2008: 82.

**Type material.** Holotype. Australia, WA, off Bunbury (33°00.5' S, 114°59.26' E–33°00.11' S, 114°34.50' E), 421–414 m, 20 Nov 2005 (stn SS10-2005 13), WAM C42465 (female specimen, cl. 5.5 mm).

**Etymology.** Named for Lynsey Poore. Her enthusiastic support of Gary's crustacean research over many decades has benefited all members of the Marine Invertebrate Department.

**Type locality.** Bunbury, Western Australia, 414–421 m.

**Distribution.** Known only from type location.

**Description.** Based on holotype female.

Rostrum straight, directed forward, relatively broad, slightly overreaching distal margin of first segment of antennular peduncle; distal part spiniform, broadened with ventral blade; dorsal surface with low, blunt median ridge, bearing scattered setae extending onto anterior part of carapace; lateral tooth strong arising from 0.58 of rostrum; ventral margin straight, unarmed.

Carapace 1.90–2.20 times as long as wide. Middorsal carina sharp, extending nearly to posterodorsal margin of carapace,

armed with two teeth; epigastric tooth falling far short of base of rostrum arising at 0.21 of carapace length; second tooth arising from 0.65 of carapace length. Dorsal surface of carapace with few irregularly scattered setae. Antennal tooth small, not reaching anterior margin of cornea of eye. Branchiostegal tooth directed forward, falling short of anterior margin of antennal basicerite. Pterygostomial angle with tooth. Lateral face of carapace with relatively large hepatic and one post hepatic tooth, but epibranchial tooth absent; epibranchial carina conspicuous.

Fifth thoracic somite without sternal tooth in spawning female.

Second abdominal somite smooth on dorsal surface. Third somite with middorsal carina in posterior 0.33; posterodorsal margin of somite moderately produced posteriorly, partially covering fourth somite. Sixth somite about 2.00 times as long as high; dorsal surface flat on midline. Telson with two pairs of minute dorsolateral spines; posterolateral angle with one short blunt spine and two pairs of longer spines (broken); terminal process acutely pointed.

Antennular peduncle reaching 0.55 of antennal scale; stylocerite not reaching distal margin of first segment. Antennal scale about 0.68 of carapace length and 2.70 times as long as wide, lateral margin slightly curved, distal blade rounded; basicerite with ventrolateral spine reaching mid point of first segment of antennular peduncle.

Mouthparts not dissected.

First pereopod with palm about 3.50 times as long as wide; cutting edge of palm strongly oblique; pollex relatively large, triangular, not recurved; carpus armed with two large spines on lateral margin; merus with very strong dorsodistal spine not overreaching distal margin of anteriorly extended carpus, distolateral margin with small blunt tooth; ventral lamina terminating distally in large acute tooth. Second pereopod not reaching mid-length of merus of first pereopod; dactylus about 0.40 length of propodus; propodus not weakly widened distally. Third pereopod slender; ischium 2.56 times as long as merus. Fourth pereopod moderately slender, overreaching antennal scale by length of dactylus and 0.70 of propodus; dactylus compressed laterally, about 0.51 times as long as propodus, propodus with distal tuft of setae; carpus 0.61 times as long as propodus; merus about eleven times as long as wide, unarmed on dorsodistal margin; ischium 0.48 times as long as merus. Fifth pereopod similar to fourth, overreaching antennal scale by length of dactylus and 0.70 of propodus; ischium 0.45 times as long as merus.

**Colour.** The pereopods, ventral half of carapace and ventral half of abdominal somites are pigmented red. The rostrum and dorsal carapace are green pigmented in life.

**Remarks.** *L. lynseyae* sp. nov. can be distinguished from the other species known from Australia by the shape of the third abdominal somite and the long slender dactylus of pereopod 4 which is more than half the length of the propodus.

### Acknowledgments

This paper is dedicated to Dr Gary Poore, Principal Curator of Marine Biology at Museum Victoria and is part of a contribution to commemorate his 40<sup>th</sup> anniversary of studying Marine



Figure 9. Live animal photographs of *Lissosabineia indica* (De Man, 1918), female cl. 8.5 mm, J46724, copyright CSIRO.

Science in Australia.

Thanks to Alan Williams and Rudy Kloser from CSIRO Marine and Atmospheric Research (CMAR) who were largely responsible for the sampling design of the “Voyages of Discovery” research program which generated the WA and Tas proportion of the material listed in this report. Special thanks to Karen Gowlett-Holmes for permission to use the photographs of the live animals taken on board and published here.

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